Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

[redacted]-F

COMMITTEE ON EXCHANGES

STATINTL

Computers in Management

SENDER WILL CHECK CLASSIFICATION TOP AND BOTTOM

	UNCLASSIFIED		CONFIDENTIAL		SECRET

OFFICIAL ROUTING SLIP

TO	NAME AND ADDRESS	DATE	INITIALS
1			
2			
3			
4			
5			
6			

	ACTION		DIRECT REPLY		PREPARE REPLY
	APPROVAL		DISPATCH		RECOMMENDATION
	COMMENT		FILE		RETURN
	CONCURRENCE		INFORMATION		SIGNATURE

Remarks:

The title pages of the books, monographs and other materials received by the delegation (see Appendix) are being translated. We will forward the translation to you when they are complete and you may indicate to us any interest you may have.

STATINTL

FOLD HERE TO RETURN TO SENDER

FROM: NAME, ADDRESS AND PHONE NO.	DATE
[redacted] COMEXSecretariat	11 Nov 75

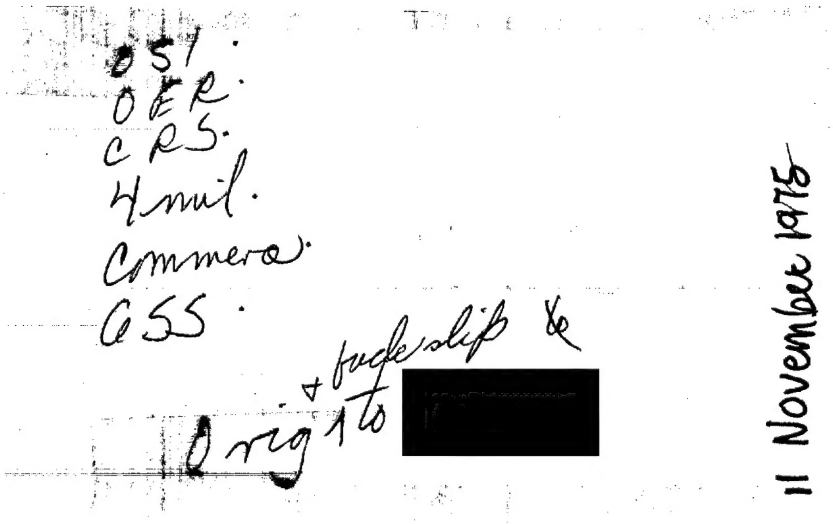
	UNCLASSIFIED		CONFIDENTIAL		SECRET

FORM NO. 1-67 237 Use previous editions ☆ GPO : 1974 O - 535-857 (40)

State Dept. declassification & release instructions on file

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5



STATINTL

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

REPORT OF VISIT OF U.S. DELEGATION ON EDUCATIONAL TECHNOLOGY TO USSR MARCH 26 - APRIL 10, 1975

A U.S. delegation in educational technology visited the U.S.S.R. from March 26 to April 10, 1975, under the U.S.-U.S.S.R. Agreement on Cultural Relations. The members of the delegation were D. Don Aufenkamp, Head, Computer Applications in Research, National Science Foundation (head of delegation); Donald L. Bitzer, Director of Computer-based Education Research Laboratory, and Professor of Electrical Engineering, University of Illinois; Harvey J. McMains, Director of Corporate Planning, American Telephone and Telegraph Company (now Vice President, National Bureau of Economic Research); James L. McKenney, Professor of Business Administration, Director of Computer Services, Harvard Business School, Harvard University; and Charles H. Warlick, Director of Computation Center, Lecturer in Computer Science, University of Texas.

The purpose of the visit was to review trends in the use of computers and other technical aids in curricula and administration of U.S.S.R. higher educational institutions as well as to explore the possibilities for holding one or more joint seminars in this area. Since the subject matter was related, in part to some of the ongoing efforts under the U.S.-U.S.S.R. Agreement on Scientific and Technical Cooperation, particularly, that of the Joint Working Group program in the Applications of Computers to Management, the U.S. delegation, in reviewing Soviet activities and in formulating proposed future activities, did so from the perspective of both the Cultural Relations Agreement and the Science and Technology Agreement. (Don Aufenkamp is U.S. Chairman of the U.S.-U.S.S.R. Joint Working Group in the Application of Computers to Management and Harvey McMains is one of the five Topic Coordintors assisting with the program of the Joint Working Group.)

The U.S. delegation proposed, in keeping with the general theme of the visit, that the visits should include:

1) research centers specializing in research and development in terms of curricular materials and computer-based systems.

2) scientific and technical institutions where computer-based curricula are used in training of specialists, technicians, and mid-level management.

3) visits to eduational institutions in which computer-based instruction is used in classroom work.

4) industrial enterprises where computer-based systems are used in specialized training of engineers, technicians and mid-level managers.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

The Soviet host organization was the Ministry of Higher and Specialized Secondary Education. Within the Ministry, our host was Professor Anatoli I. Bogomolov, D.S.C., Head of the Education and Method Department and Head of the Hydraulics Chair of the Moscow Automobile and Road Building Institute. Professor Bogomolov had also been head of a Soviet delegation to the U.S. on educational technology in October 1974.

The following itinerary and visits were arranged for the U.S. delegation:

Moscow
- Ministry of Higher and Specialized Secondary Education
- Moscow Institute of Steel and Alloys
- Research Institute of Problems of Higher Education
- Moscow Power Institute
- Moscow State University (School of Computational Mathematics and Cybernetics)
- Moscow State Institute of Control and Management (formerly Moscow State Institute of Engineering and Economics)
- Exhibition of Economic Achievements

Leningrad
- Leningrad Polytechnical Institute
- Leningrad State University (informal meeting with individual faculty member)

Novosibirsk
- Novosibirsk State University
- Computing Research Center of Academy of Sciences
- Institute of Automation

Kiev
- Kiev State University
- Kiev Polytechnical Institute

Visits were conducted throughout in an atmosphere of mutual cooperation. The principal emphasis was, of course, on learning of Soviet efforts and trends in the use of computers and other technical aids in the education of scientists, engineers and technical managers. There were, in addition, many opportunities for members of the U. S. delegation to respond to questions from our Soviet hosts and for informal discussions on topics raised during the meetings.

The U.S. delegation received copies of many instructional materials and other books and brochures concerned with the Soviet eductional process. In addition, many photographs were taken of classrooms, computer facilities and meetings throughout the trip.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

VISITS IN MOSCOW

MINISTRY OF HIGHER AND SPECIALIZED SECONDARY EDUCTION (MHE)

Meeting at Beginning of Trip

There was a general discussion with Dr. A. I. Bogomolov of the plans for the U.S. visit as well as of the work of the Ministry.

In addition to the Ministry of Higher and Specialized Secondary Education each Republic has a similar ministry. The curriculum is approved by the MHE and the same standards are supposed to apply throughout the country. There are about 60 methodological agencies, e.g., physics, chemistry, metallurgy, etc., under the MHE to see that various aspects of its policy are carried out. Furthermore, there are an unspecified number of Scientific and Technical Councils that make recommendations on curricula. Each contains as members leading scientists, representatives from industry and representatives of various higher education establishments. The Council on Mathematics is headed by Academician Kolmogorov; that of Applied Mathematics by Academician Tikhonov (both of Moscow State University). These Councils also determine when student theses are complete. (The indication was that, in theory at least, the Council of Ministers of the U.S.S.R. approves Doctor of Science degrees). There are two general groups of higher education institutes -- those having general curricula and those with individual curricula (with highly qualified staff as Moscow State University.)

Dr. Bogomolov mentioned his forthcoming trip to the U.S. in May which was being arranged by Control Data Corporation. The interest in PLATO was obviously great.

Meeting at End of Trip

This meeting was devoted to a general overview of the trip and possibilities for future joint activities.

The MHE works closely with industry. Because of the close coupling of institutions with industry, some institutions give less emphasis to the use of computers in education. Leningrad State University, for example, holds the position that computers should be used only for problem solving.

There appears to be no official plan for the growth of computers in education but, nevertheless, the MHE does try to plan in regard to the use of computers in many aspects of education. For example, the use of computers is encouraged by providing for obligatory study of computers in various courses, including one month of practical work where students operate the computers. (It is considered a great success when a machine is overloaded.)

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

In terms of future activities, a seminar was discussed in general terms as a mechanism for working out a joint program of research and possibly another seminar. The U.S. side left suggestions for a follow-up seminar on computers in education based on the following principal themes:

1. Institutional planning with emphasis on the organizational issues of economics, sources of support and development of skills and human resources.

2. Institutional sharing (among institutions) with consideration of major topics as standard curricula and programs, program development and distribution, social and organizational issues of sharing, communication costs and trade offs, and networks.

3. Experimentation in delivery of computer-based education with emphasis on experiences, quality and economic evolution and future programs.

VISIT TO THE MOSCOW INSTITUTE OF STEEL AND ALLOYS

The Director of the Institute is V. A. Romenets (Head of Economics Department). Others participating in much of the discussion included Leschinsky, Kashkovsky and Morgunov (approximate spellings).

The visit included the following main items:

1) discussion of the use of computers in teaching
2) visit to laboratory of engineering economics
3) discussion on work in economics and organization of production
4) visit to computer laboratory

The Institute was founded in 1918 at Lenin's suggestion for research in metallurgy. The first areas selected were iron and steel. Other areas have been added since then. There are currently 8,000 students, of which 550 are post-graduates. There are 700 teachers, of which 100 are professors. There are 50 chairs (departments) divided into 5 faculties (schools) with the following designations:

1) ferrous
2) non-ferrous
3) semiconductor
4) physical and chemical
5) fundamental

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Some chairs are for general studies as mathematics, physics, etc., and others are for special studies. Students receive 5-5 1/2 years of training. There are three years of post graduate work. Students receive 6 months of practice at industrial plants and/or special institutes. The curriculum includes a totality of approximately 42,000 lesson hours and presupposes physics, chemistry and mathematics. About 40 per cent of the students admitted already have 2 years of industrial experience. The admission age is 18-22 years. On the average, about 60 per cent are men; 40 per cent women. The ratio ranges between 70/30 in heavy metals to 50/50 in semiconductors.

There are about 60,000 square meters of floor space with each chair (department) having about 400 - 800 square meters.

During the first and second years, students receive 610 hours of non-technical instruction including work in

- preparation of programs for computers
- general engineering
- mechanical engineering
- social economics
- history and philosophy
- political history of socialism and capitalism
- economics of industry
- organization of production

Students receive two semesters of introduction to ALGOL and FORTRAN and special languages for smaller computers and then apply this work to special courses. There is no hands-on use of computers nor do students punch their own tapes or cards.

The principal computer facilities at the institute include a Ryad ES 1020, a Minsk 22, a NAIRY 2, M 220, MIR I and II computers and many MN 7 analog computers (elaboration below) which are used in two principal ways:

1) development of modeling of technological processes and for computation
2) administrative applications including scheduling, attendance and admission

There are about 200 "batches" of 25 students each in the day school (the remainder of the 8,000 students are apparently in the night shift school). Each batch has a class monitor. Testing results are tabulated - mark sense cards are used - and teachers can ask for records on students. Many materials were received (see listing at end of report). Some programs were for analyzing the curriculum in terms of dividing and distributing the total number of hours to various subjects and courses. One method was developed for finding logical correlations among subjects in response to industrial needs. (See booklet on Methodological Indication of Scientific Methodological Proof of Student Plans, by Romenets and Morgunov of the Institute of Steel and Alloys, Moscow 1974).

The central computer facility included a Ryad ES 1020 computer with the following principal components - 2420 processor, 7022 tape reader, 7032 printer, 5511 tape units (4 units) and a 6012 card reader.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Future engineers study economics of industry. There is an emphasis on a scientific approach to management of labor and other special work on industrial organizations. Students plan personal programs on a weekly basis and use computers in individualized work. Each student is treated the same as others in courses. Four kinds of engineers are trained at the institute

- general engineers
- technical engineers
- research and development engineers
- industrial economics and management engineers

Special groups were looking at special management problems.

We visited one of four cybernetics laboratories containing about a dozen MN7 analog computers. Either plotters or scopes could be connected as output devices. All had plugboards with problems of physical phenomena already set up, including:

- a double pendulum problem
- an example of space trajectories
- a problem in differential equations
- a couple of examples from theoretical physics
- solutions (flowers) to the differential equations

$\tau = a + b \cos\omega t = C \sin\omega t + d \sin\omega t,$

$X = \tau \cos t$, $Y = \tau \sin t$ (associated with a German mathematician/botanist of the 17th century).

- a field theory problem
- illustration of the method of gradients
- example from differential geometry

We visited a classroom/laboratory for a small NAIRY-2 digital computer with modified FORTRAN and paper tape input. Several other classrooms were also visited. Usually 20-30 students. There was a heavy emphasis on pre-testing before a student was allowed to use the digital computer (it was considered a scarce resource). Students often had a set of buttons at their desk for answering multiple choice questions. Results appeared at the teacher's console. This was demonstrated by one student, Ludmilla Kulchitska.

The central computer facility included a Ryad ES 1020 computer with the following principal components - 2420 processor, 7022 tape reader, 7032 printer, 5511 tape units (4 units) and a 6012 card reader.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Labs for MIR I and II computers were also visited - paper tape input but one had an alpha-numeric display. Business games were said to run on the machine. Organizational problems in industry involved both homework and work at the lab. The results were analyzed in regard to such major aspects as labor, production, transport and expenditures. Another lab was visited which was devoted to the treatment and preparation of economic information. It contained the usual assortment of sorters, punches, etc. Several other labs were also visited which concerned such fields as crystalography (NAIRY 2 computer), chemical analysis (data obtained used as input on analog computers), non-ferrous metals (MN 7 analog computers) and ferrous metals (MIR II computer). One special lecture hall was also demonstrated which had closed circuit TV and other audio visual aids.

VISIT TO RESEARCH INSTITUTE OF PROBLEMS OF HIGHER EDUCATION

We met with the Director, V. N. Chetverickov. Others participating included the Deputy Director, A. J. Saveliev (has also visited US); Professor Lemenova; S. Katunskaya, senior scientific worker; and Lumonova, scientific worker (some spellings may be inaccurate).

The institute is very new (only a few months old). The Institute deals with problems of improving education - both in theory and methodology in topics that involve the teaching process. The work is carried out through seminars, conferences and publication of materials dealing with education. There is much cooperation with scientists at other institutes in carrying out the program. Special semantic models are developed for studying in the teaching process with an emphasis on technical aids and the requirements that these technical aids must meet.

There was also a strong interest in the PLATO IV system. There was a strong expression that suitable hardware precluded development of adequate systems. (A joint seminar was held with Control Data a year ago and another one is planned for May in the US.) But it was also emphasized that "it was not really this lack of hardware which impedes the work but the gap between mental development and technical facilities!!"

The bulk of the scientific workers at the institute hold scientific degrees. Each of the 10 scientific departments is headed by a doctor or professor with a teaching record of about 20 years. Each section within a department is headed by a doctor or candidate and scientific workers carry out the theoretical research. There are a total of 500 scientific workers but not students.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Attention is given to economics of education but they also examine the social aspects. The role of computers was said to be three-fold.

1) Use in teaching.
2) Teaching future specialists how to use computers. They want every graduate to know how to use the computers.
3) Direct management of instruction. This would include scheduling, collection of data on progress and academic standing.

There is a 10 year secondary system and they are working on a lifelong educational process (an expelled student, for example, is looked upon as a failure.)

THE MOSCOW POWER INSTITUTE

We met with Prorector Shevtchenko and Professor Utkin. The Moscow Power Institute is 70 years old. There are 10 faculties (schools) and 6 faculties devoted to the evening school. There are also two branches in Kazan and Smolenz. The Moscow institute has 15,000 students, with 25,000 in all including branches. A total of 1,000 students are postgrads. There are 1,700 teachers and lecturers; 120 doctorates and 600 candidates. Much research is also carried out involving 2,500 engineers and scientists. About 14,000,000 rubles are allocated for research per year out of a total operating budget of 80,000,000 - 100,000,000 rubles. A large but unspecified part of the support comes from industry and this helps to attract good students. One half of the students are involved in research projects; after the 3rd year it is required.

The program is the usual 5 1/2 year one. The 10 faculties include ones in heat, power, radio engineering, electronics, automation and computers (mainly digital, some analogue), electrical engineering. There are 44 specialities (majors). Students volunteer for work such as building equipment and emphasize practical applications. Postgrads are often selected for research at other special institutes. One week in March is devoted to presentations by students of their research. There is an underlying emphasis to connect classwork with research. When students are in 4th or 5th year, they can choose from about 20 electives. Classes run for 5 days per week with about 6-8 hours per day. Big lectures are supplemented with smaller lab sessions.

The "computer research" emphasizes management applications. The computer facilities were small for the size of the institute - a Ryad ES 1020, a Minsk 32 and 22 and a BESM 4 are the main machines. Students take 100 hours of organized computer programming the first year. (There

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

are 14-16 weeks in a semester). In the second year students have 34 hours with an emphasis on flow diagrams. In the third year, there are 34 hours of plus lab work of programming with experience on the NAIRY and other computers. (Lectures are 2 hours; labs are 4 hours). In the 4th and 5th year there is an emphasis on problem solving. Specialization in cybernetics envolves even more work. A professor teaches 1 or 2 courses per year, which involves about 100 hours of lectures. Professors also have outside contracts with industry.

The faculty (school) of radio engineering admits about 200 students per year. Students apply to a single faculty. About 10 per cent drop out, most of these in the first year. The first and second years for students are about the same in all faculties. There is a big scientific council with representation from all faculties that meets once a month. The rector will hold a conference every two weeks. Evening classes are about the same as day classes. Time is reduced, there are only 70 hours of evening work for 100 hours of day school. Evening course students receive no industrial or research work (many are probably working in industry during the day). About one out of two or three students is admitted to the Power Institute. The usual stipend is 45 rubles per month with up to 80 rubles per month for a good student.

Five years ago, about 20 per cent of the students had to have industrial experience and there are currently special programs for those entering from industry (about 15-18%). The last six months for curriculum involves an industrial internship. The institute tries to follow up on students (this is the responsibility of the dean.) There are also special courses for qualified engineers and for faculty from other school who wish to improve their qualifications. Every teacher goes through a retraining process every 5 years, and there is a special program for training faculty in the use of computers (which even the rector has taken). In terms of the student population, the ratio is 50/50 between women and men in some faculties, but men dominate overall. The percentage of women is increasing. In some chairs (departments), foreign language, for example, women constitute 25 per cent of the staff. The head of the semi-conductor faculty (school) is a woman as was a former deputy head of the department of atomic power stations.

We also visited the computer facilities. The director was Chelnikov. Computers are used in teaching and at higher levels in research. Industrial problems are also solved in language as FORTRAN and ALGOL 60. There are a few problems involving work in economics. Students bring their problems to the center and are permitted to operate the smaller machines. There are 208 employees in the computer center. About 40 per cent have advanced training; 60 per cent are operators and other staff. There are 8 part-time math instructors who also assist. The faculty departments also assist. The large computers are available 24 hours a day with student use permitted between 8:30 a.m. and 11:00 p.m. Student work is returned in less than 24

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

hours. Some of the compilers come from the Academy of Sciences. The ALGOL 60 compiler for the Minsk 32 was developed at the Power Institute.

There are no remote terminals - only plans for the present. Chelnikov has an advisory committee. He hopes to double the number of computers and improve the efficiency by an order of magnitude - hopefully an ES 1050 with graphic terminals will be available in the next two years. There is an association of Minsk users; also one of ES users. The Minsk users group was organized by the Central Statistical Administration. There are 800 members. Membership fees are paid and there is a board of directors. There is also a computer center commission attached to a Scientific Council of the Ministry of Higher Education.

MOSCOW STATE UNIVERSITY

FACULTY (SCHOOL) OF COMPUTATIONAL MATHEMATICS AND CYBERNETICS

We met with the Dean, Academician A. N. Tikhonov; Professor Korolov, Head, Chair of Computational Complexes; and V. V. Voevodin, Head of Computer Center.

Professor Korolov is also the author of the first (and other) operating system for the BESM6. He received the Lomonosov prize for developing systems of numerical analysis.

Academician Tikhonov discussed the use of computers in both education and research. The Faculty was founded 5 years ago and thus the first graduates are just coming out. Tikhonov was head of the chair of mathematics in the Faculty of Physics for 30 or 40 years, and then for a time head of the computer center in the mathematics department. The main task of the Faculty is to train potential faculty members in the use and development of software. There is no work at the University in hardware design. About half of the students are in the use of computers and half are in the preparation of software (systems software).

The belief is held that scientists should improve qualifications every 7 to 10 years. Students who have a good general background often do not have practical experience. After students have become third year students, they are dispersed among the chairs and attached to scientific seminars. Seminars are fixed and students are not ordinarily permitted to change. Although they may audit other seminars; exams are taken only in one. In the seminars, reports are made on scientific periodicals or basic manuals. In the fourth year, there is a course project. In the beginning of the fifth year, there is practical work at one of the computer centers involving a diploma project (in fact, the student works on the project during the last three years). The majority of the students use computers in the diploma project.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

In regard to software quality, there was discussion of the feasibility of having packages of specialized applied programs related to physics or chemical technology, for example. It is perhaps easier to do this for mathematics. Tikhonov did mention a complete package used in photon nuclear experiments which is described in IFIPS reports. Data is collected at experimental sites, processed statistically and interpreted directly.

Tikhonov also described the system

$$X + 7\,Y = 5$$

$$\sqrt{2X} + \sqrt{98Y} = \sqrt{50}$$

which was solved to 500 places on the MIR computer. The MIR has a variable length word and they asked for 500 place accuracy.

Academician Prokherov is chairman of mathematical statistics in the Faculty of Computational Mathematics and Cybernetics. Bolshev, a corresponding member of the Academy, works with statistical packages. Within computer science students do research on operating systems - but changing the one used for service work is discouraged because of possible incompatibilities. The computer center is linked functionally to several departments - chemistry, physics, geology, biology, economics - and also to the administration. Scientists from the computer center are invited to take part in departmental seminars. There is also some application of computers in the social sciences - on global systems and population dynamics, for example.

In regard to industrial applications, the Faculty considers the principal tasks to be the preparation of its students in the use of computers and also students from other faculties. Industrial research is coupled with university research so that students will see how computers are installed in industry. This is often done through seminars.

The computer center has 1 BESM 6, 1 Minsk 32, 2 BESM 4's and many smaller computers. The first BESM 6 operating system was written 1968. It is still basically a batch system that is disc oriented. The CPU use is 96% - 98%. There are 450 employees in the Center. About 2/3 are mathematicians and programmers, and the balance are faculty people. There are about 60 electronic engineers for maintenance of the equipment at Moscow State University. The hope is that a network can be developed at the university with big machines in the computer center, medium ones in the faculties (schools) and smaller ones in individual labs. A new building is two years away. At that time they hope to add another BESM 6 and..."maybe an advanced computer if it is developed by then."

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

MOSCOW STATE INSTITUTE OF CONTROL AND MANAGEMENT

We met with P. A. Kolesnik, Prorector; V. I. Dudorin, Professor, Head of Chair of the Theory of Automatic Control Systems; S. P. Baevz, Director, Computer Center; P. M. Prokunun, Head, Chair of Economic Cybernetics; and O. N. Mamontov, Head, Chair of Computers. (The rector Ms. Kaslova was not present.)

This visit was arranged by Bogomolov at nearly the last day in Moscow. The Institute is only a few days old and was formerly known as the Moscow State Institute of Economics and Engineering. The change in name was due to a change in program. Previously the emphasis was on economics and production. Now it is on engineers involved in the management of production. There are resulting changes in curricula. A series of new disciplines added on scientific approaches to management. Some of the areas emphasized include construction, chemical industry, power, city control and management, and automobile transport.

Students study for five years. A secondary education is a prerequisite. There are 8,000 students currently. A new complex is planned about 20 to 30 kilometers from Moscow. One building is already open and 4 others are nearing completion. (The enrollment will be increased then.) A research laboratory and a computer center are part of the institute. There is a faculty for higher management personnel and also one concerned with improvement of teacher education. They are preparing students also in economic cybernetics and automatic control systems (i.e., management control systems). Computers are used only in 2 chairs (departments) - those of economic cybernetics and automatic control.

About 80 per cent of the students admitted go into management programs. There are also special three-month programs for managers with about 100-150 students. Included would be, for example, deputy directors of enterprises, directors of small enterprises, (not of all-union importance) and chiefs of departments at enterprises. Many people coming in have already completed an educational program. The principal academic programs are:

- theory of control: fundamentals
- introduction to engineering cybernetics
- automated control systems
- economics of branches of industry
- organization of production
- mathematical statistics
- finances of industry
- law

The academic work is supplemented by work at enterprises where computers are used for management.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Mamontov's chair (computers) has the task of work in programming and use of the computer in solving problems. Special work comes later. They have developed, for example, a model of an engineering plant. Using the model students work out their own solution to problems. The director of the computer center, Ms. Baevz, described the emphasis on an effective use of the computers in education. She has up to 40 student groups and tries to organize the work in the effective way with the use of the computer. One administrative subsystem includes

- analysis and recording of day to day progress of students
- student admissions
- a subsystem called STUDENT
- subsystem for post-grads and finances

The facilities consist of a Minsk 32, a Ryad ES 1020 and NAIRY computers.

There is cooperation with industry in two ways

1) orders from enterprises for particular tasks
2) projects in which students work in industry

as well as personal contacts through graduates. Most diploma projects result from requests from industrial enterprises. Feedback is obtained, for example, through joint conferences between industry and the institute. The State finances education. Research is financed by the State and by industry. The ratio was not specified. Projects on management control systems originate mainly from engineering firms. The Institute tries to keep ahead of industry in regard to computer facilities. There is an emphasis, too, on planning analysis. Due to the change in emphasis, students in management training are only in their second year.

VISIT TO EXHIBITION OF ECONOMIC ACHIEVEMENTS

A brief visit was made to the Exhibition of Economic Achievements, particularly, the exhibition on computers. The principal exhibits included an ES 1030 and another system that was being used for demonstrations of business applications. There was also a display of many peripheral devices. Litterature was received both in English and Russian on the ES 1030 computer.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

VISITS IN LENINGRAD

Introduction

In Leningrad the delegation visited two technical institutes and two members of the delegation met separately with a member of the Leningrad State University faculty. We learned in general and in detail the nature of the required computer introduction required of all undergraduate students. Further, we confirmed our opinion that most polytechnic institutes have Minsk 32 computers and M-220 or their equivalent for the introduction of programming and electronic data processing principles. There is a set of practice problems which require the students' use of these computers during the first three years of their education. There exists a standard administration package developed through coordination of the Ministry which is utilized throughout all the polytechnic institutes. Typical computer usage seems to be 40% for teaching, 30% for research and 30% for administration. Teaching blurs with the research use as most research projects are considered teaching efforts with subject specialties in their fourth and fifth-year diploma projects.

These projects and the research program in general are coordinated by a series of industry councils which discuss both the curriculum and necessary research for industry and the desired research from the institution. This research effort includes four organizational forms. Research carrried on by the institutes is supported by the Academy of Sciences as flat 5-10 year grants. Research efforts supported in institutions of higher education seem to be supported jointly by the Academy of Sciences and higher education, others only by the ministry of higher education, and finally research supported by industry with the participation of all three institutions of higher education. An informal sample led to the appraisal that universities were third in line in priority in receiving new technology.

It would appear that about 1970 a common policy for all undergraduate institutions was adopted requiring five courses of instruction in computer and its use throughout Soviet institutions. To support this education program, the aforementioned computers were provided throughout all institutions throughout the Soviet Union. These computers to this date represent the bulk of computing resources at most institutions.

LENINGRAD POLYTECHNICAL INSTITUTE

We met with the following: Professor K. P. Selesnev, Rector; Associate Professor V. A. Serebrennikov, Vice Rector; Professor J. I. Ukhanov, Vice Rector for Science; Professor V. K. Zakharov, Head of the Department of Automation and Telemechanics; Professor A. M. Yashin,

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Head of the Chair of Information and Management Systems; Associate Professor V. D. Yefremov, Department of Automation and Telemechanics; Associate Professor E. M. Shianov, Department of Measurement Technology; Associate Professor L. N. Andreyev, Department of Computer Mathematics; and A. I. Timohova, Coordinator, Department of Foreign Relations.

The Leningrad Polytechnical Institute is 75 years old. It has a large undergraduate program of 18,500 students with a staff of 14,500 and an annual budget of 32 million rubles. The faculty was organized into eight groups. The eight main faculties were hydraulics, electromechanical, power engineering, mechanical engineering, physics and metallurgical engineering, engineering economics, physics and mechanics, and radio physics. In addition they had a faculty for teaching foreigners and an evening faculty and a correspondence school faculty. They had a special faculty to improve postgraduate education and a faculty that was focusing on the improvement of teacher education and teachers at other institutions. There were faculties for special electrical engineering qualifications related to the numbers in the field. They are now setting up faculties for new specialties as a result of articulated demand from industry on the automation of robots, biomechanics and laser engineering.

Industry demands are made known through a system of councils, some related in particular to the Academy of Sciences and some special councils of the State Committee for Science and Technology. However, in Leningrad there are also several commercial councils related to particular industrial branches such as power utilities. These councils work with particular Chairs in each of the faculties to articulate curriculum needs from industry's perspective and identify potential research projects. They do not encourage scientists necessarily to work in industry, but encourage scientists to work on research projects that benefit industry and the institution. This message was repeated several times. It is not clear how well they follow that up. It is clear that industry provides significant research sponsorship in the form of economics for the accomplishment of their ideas. There are about 100 organizations in the Russian Federated Republic that work with the Polytechnical Institute.

The computer is used in three forms in support of their educational process. The first is a general required curriculum which we will describe below. The second is an adjunct to the specialty courses within each Chair to solve problems and make economic analysis, as well as to do simulation work on the formulation of alternatives. The third form is to research within specialties, either related to student diploma work or particular research contracts or individual professor research efforts. At present computer service is provided in three forms: small computers and laboratories of the Chair, the Computer Center service which is at this institution is based on a Ryad 1020 and a M-220, or they can go outside and purchase time on BESM6 and other large-scale computers as they are needed. The economists use a BESM-4; Radio Engineering has a Minsk 22; Electromechanics has a NAIRY 33 with terminals and Hydrology is getting an ES 1020.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

They try to rely on the computer in their research efforts in the same fashion as it is relied upon in industry and if possible lead industry in its use. Thus they have many Chairs and faculty members involved in the use of computers in both the teaching and research in their specialties. They have accomplished this use by a strong effort to train members of the faculty in their five-year update process to understand the fundamentals of computing. It is not particularly clear as to how or how broadly this has been done as we talked by and large to enthusiastic computer users which were a small sample of the total faculty. The curricula itself seems to be five courses:

1. Electronic data processing - hardware fundamentals;
2. Algorithmic languages;
3. Programming systems;
4. Practical work in a laboratory involving operating, running programs, and solving problems;
5. The economics of engineering design, which means an analysis relying upon computer programs to consider the economic impact of alternative engineering designs.

These courses take 100 hours for the first two courses, two months for the practical examination and it is not clear how much for the third. As examples, the Computer Center was a Well organized computer center relative to those we saw in Moscow. It was glass enclosed with air conditioning, a false floor, good lighting, humidity control, and seemed to be run in an efficient manner. The computer was the new Ryad ES 1020. We visited one lab which had a small computer programmable by metallic plugs. The students were learning the operation and fundamentals of a computer, as well as introduction to machine language programming through the use of this computer. It seemed to be a lab to the first course in computing.

To identify how they work closely with industry, one of their faculty members headed the Aswan Dam construction project for three years and returned to teaching. A second Chair worked on automatic control of welding systems on a contract for industry.

We were accompanied in Leningrad by John Sheehan of the Embassy at this particular meeting who encouraged us to open the discussion to our hosts. This provided a thoughtful discussion and we had a good exchange of ideas on the state of the art in using computers in the U.S. as well as understanding their own use. They were an enthusiastic group and we exchanged a good bit of information.

LENINGRAD ELECTROTECHNICAL INSTITUTE

We met with Professor A. A. Vavilov, Rector; Professor V. I. Timokhior, Vice Rector; Professor V. Smolov, Chairman of the Department of Computer Engineering; and Professor Alexandrov, Chief of the Computer Center.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

The Leningrad Electrotechnical Institute is an electronics institute that began as a telephone-telegraph institute in the late 1800s. It presently has expanded its faculty to 10 specialties, including radio electronics, technical cybernetics, computing and solid state physics. There are six daytime faculty with 10,000 students. At present they are building a new facility to house their 500 faculty members organized in 42 Chairs, each with its own lab. There is a special faculty on computers and theory of management which enrolled 1,000 students.

All students enrolled in the institute use computers in their general course and most specialties rely upon computers as an aid to their third-, fourth- and fifth-year work. Further, they have coupled educational programs with their research effort in the labs and several use on individual projects. Again the general course is identified as: (1) fundamentals of electronics, (2) programs in algorithmic languages, (3) automatic control systems, (4) computer practice seminars for two months, and (5) engineering and economics in management, given in the fourth year, which is an application of computer design of the engineering design and requires 130 hours of exposure. Most Chairs then continue work relying upon computers in their course and research projects.

There is a specialty on fundamentals of mathematics for computers to train specialists in hardware and software. This course is 600-900 hours of applied math related to computing out of a total of 4,500 hours per student. The first course in this curriculum is a programming in algorithms which is 140 hours over two years. The second on arithematic and logic is in the third year and requires 130 hours. A third course on probability also requires 130 hours. There are two courses on operating systems, each requiring 100 hours. There are other Chairs which rely on particular aspects of the computer. For example, the Chair on radio engineering has a course on computer design which includes 85 hours in microelectronics, another course of 85 hours in electronic circuits, 170 hours in electromagnetics and 150 hours on computers and design of computers.

Professor Alexandrov and the head of the Chairs arranges a schedule of work on the computers monthly in advance. The methodological guidance is from the Computer Center under the computer Chair, but direct guidance is given by the employees of the center on programming and the use of the computer system. The Computer Center is now 15 years old and includes a third-generation computer in their terminology - in actuality it is second as they have only Minsk 32's and then two M 220's and an assortment of Minsk 22's. They intend to receive an ES model 1040 or 1050 in the near future. They also have two Polish computers, an ODRA 1204 and 1304 which the students use in their first three years.

Their research as mentioned above, is financed by two sources. The Ministry of Higher Education - "professorial research within the speciality within an approved curriculum and research-related project" and contract research from the industry councils. They emphasized industry cooperation

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

and identified that they held several conferences between the research institute working on particular aspects of science and branches of industry to strengthen their ties and involve themselves with industry. They have basic Chairs in industry which were set up for three-year periods by the Physical and Technical Institute of the Academy of Sciences. One of these Chairs prepares specialists in optical electronics. It is not clear exactly how they work with industry but it would appear very much as we at the Business School do in seeking joint research projects that are complementary to our own educational programs. There are technical councils that decide what to pick up, what research projects to accommodate within the institution. Industrial demand at this point in time exceeds the institute's capacity to supply.

There are two specialized faculties to improve faculties in practicing engineers. There is a policy in higher education administration to take the equivalent of a sabbatical and leave and improve oneself every five years. There is some reluctance on the parts of some members of the faculty to become involved with the computer system and it seems to be a problem. However, research funds are going to those projects with computer funds and this seems to attract some members of the faculty to do something about it in their five-year retooling period. They have taken a Minsk 32 and put up a time sharing multiprocessing operating system which allows dynamic reallocation. It has a three thousand word, 32 bit word memory block. They use ALGOL on the system to teach programming and the entire system to study "new" operating system concepts. They are a very enthusiastic group of individuals and quite open about discussing their problems.

One of the more interesting projects they had was a minicomputer that is wired to a lighted wiring diagram on the wall that depicts the computer electronics the students are operating. As the students code the machine, the lights on the wall identify the steps the computer is going through to process the student-entered code. The faculty causes machine errors and through the functioning of the wall display, the student is supposed to analyze what is wrong with the computer. This seems to be their introduction to learning the fundamentals of computer systems. It is lovely schematically as it identifies in real time what is going on. There were nine students in this class--four women and five men.

INFORMAL VIEW OF LENINGRAD STATE UNIVERSITY

McMains and McKenney had a long lunch with Professor Ivan M. Siroyezhin of the Leningrad State University. He informally identified that there was a policy problem as far as the universities were concerned and that they were last in the pecking order of receiving computers in higher education. The first were the Academy of Sciences - sponsored research institutes which receive high priority for all new computer systems. The second seemed to be the Polytechnic Institute because of their relationship

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

with industry and industry is concerned that the Polytechnic teach computers the same way they are using them. Thus they get the second round of new systems. This implies that industry has first priority overall. The universities are expected to cooperate for computing services with both industry and the research institutes and therefore have been last to receive new computing technology. Most University academicians work in research institutes and therefore have access to computers. The students and the undergraduates and in non-research institute subjects do not have access to this computer technology and therefore suffer.

Individual faculty members involved in computing and doing research who rely upon computers are aware of Western capacities, progress and development and are mildly embarrassed at their state of affairs. Siroyezin and McKenney were on a panel in 1967 where he produced some very exciting ideas on his use of gaming and modelling. He has yet to put these on a computer and felt chagrined about it. They do, in fact, work quite a lot with slide rule type activities and small computation systems to punch in a large amount of data and look at simulation problems. The lack of computing has made them focus very hard on general theories, particular algorithms to develop clever and concise methods of computation. They also identified that the professors in the exact sciences were not particularly enthusiastic about using computers in "education" other than as computational aids in physics, chemistry and the classic way of using it. This was further supported by the fact that the applied mathematicians were in charge of computing and tended to use it as a numerical analysis machine, not as a pedagogic machine, and had done little with it to explore these potentials. Thus one got the feeling that the faculty was very much like the traditional faculty that was relying upon the computer simply as a large computation system to support the traditional forms of education and not doing much in an innovative fashion. The people in the social sciences who would like broader use of computer systems were denied these by the state of the art, that is, the present systems are large computation-oriented, not accessible to large banks of data, nor shared input systems but classical batch systems for large amount high-speed computation and little amount of memory. This technology is not very useful to the social sciences and therefore not being used very much.

(The preceding is one faculty person's opinion but is sound judgment and to be considered.)

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

VISITS IN NOVOSIBIRSK

VISIT TO NOVOSIBIRSK STATE UNIVERSITY

We met with the Rector, S. T. Beleyev, and the Director of Research, N. G. Zagarukhin and two other representatives of the University. The Rector provided the delegation with an overview of the university.

Novosibirsk University cannot be separated from the research activities of Akademgorodok although it is independent of the administration of the Academy of Sciences. The university was founded 15 years ago and works closely with all research institutes in Novosibirsk. As such, it is unique in the USSR. The primary task of the university was described as the preparation of research workers in science. Consequently, the university needs many professors and teachers who work actively in science. Therefore, almost all professors and most assistant professors are people invited from research institutes. After students received three years general education within this institute, they begin to work in research laboratories of institutes. Many stay at Akademgorodok to work in institutes. Novosibirsk University graduates are also in big demand, particularly in the far east and Siberia. They are also invited to teach in other universities in the USSR. The facilities of the university are used mainly in teaching in the first three years. Students have access to all facilities of Akademgorodok.

Akademgorodok has 18 science institutes and there are 4 research institutes in the city of Novosibirsk. All are engaged in natural sciences, the exceptions being one on economics and one on philology and philosophy. Novosibirsk State University is primarily engaged in the study of natural sciences. This is accounted for by the fact that they use personnel of the research institutes. When they set to the task of organizing a university here, they did not intend to make a complete university. In Tomsk (near Novosibirsk) there is a good (and the oldest) university in Siberia, and it was not necessary to duplicate its general program. There are approximately 4,000 students at the university. Students are from Siberia, from the far east USSR to the Urals. Only 25% who study come from the Novosibirsk area.

One of the more unique features of the university is the quality of its students. To prepare graduates for research in various areas of science requires good students and the university searches hard for students. The selection process makes use of a kind of an intellectual olympics. The university has, for example, sent representatives this year to 32 towns in Siberia and the far east to search for the best students. They will come here in August for study and rest. The most talented in mathematics and physics will stay in a boarding school, which is used for better preparation of students in their last year of secondary school. They look for the most talented students and particularly those from remote locations; therefore, they are not as well prepared. About 500 to 550 students study at this boarding school. The university admits about 800 students each year to NSU.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Novosibirsk University has 6 Faculties, the largest of which is mathematics. Each year the Mathematics Faculty admits about 300 students. Physics admits up to 200 students each year. Natural science (biology and chemistry) admit about 150 students. Geology and geophysics admit about 50 students each year. The Economics Faculty admits about 100 students (actually economical cybernetics and econometrics). The Faculty of Humanitarian Science admits about 50 students. Several Faculties have an emphasis on improving teaching and "update" teachers from other institutions. There are about 200 graduate students at the university. Research institutes also have graduate students independent of the university. The Mathematics Faculty has both theoretical and applied sections. The graduates of applied mathematics usually go into computer work. Mathematicians, chemists, economists, and geologists are all taught applied math (or computer science). Many of them use computers while here and then go on to computer work. Most mathematicians, physicists and chemists have computer science as their minor.

There is no direct instruction using programmed courses on computers. It was the Rector's personal opinion that such courses are useful in business games in economics. (He is not satisfied with what they have but they are working to improve them.) They are working on new business games independent of those received from the USA to reflect difference in economic systems. These economic models are used in big courses and require computers. He feels that the use of computers in direct education will be useful in teaching masses. However, at Novosibirsk University they are preparing high quality specialists in the sciences who need individual attention and the Rector felt that there is no real urgency for CAI at the university at this time. The Rector understood that it would take very much time to develop adequate course materials. The Rector is a physicist and noted that in physics even the basic courses change every year. Therefore, in his opinion the use of the computer for instruction of physics will be particularly difficult.

All students go through two stages with respect to the use of computers. (1) They get a general acquaintance with the design of computers and with programming. During this phase every student writes and runs computer programs. (2) They use computers in student research projects. Computers are used as an integral part of 60% to 70% of student diploma research projects. Students use computers at the university, at the various research institutes or at the Academy of Sciences Computing Research Center.

Novosibirsk University has two (medium size) M222's, and they have access to the BESM-6's at the Academy of Sciences Computing Research Center. The students do not have free access to computers, that is, their work must be project or course related. Ordinarily, they use punched cards for input at the university. Those in 4th and 5th year work at the other institutes where there is access to large computers.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

The university computer center is accountable to the Rector's office. The Rector doubted the need of a large computer center since the Academy of Sciences Computing Research Center was available. At first, he tried to avoid a computer center altogether. However, there were too many students to send to the labs, and they had to set up the center to handle basic teaching needs. Then he faced the problem of where to place the computer center (in what Faculty?). He recognized that placing it in the Mathematics Faculty would bias access. Therefore he placed it in a general position to serve the entire university.

As to future plans, they call for (1) the replacement of equipment and the strengthening of the computer center. (The Rector's personal view is that it is not wise to build a separate big university center); (2) strengthen the Akademgorodok central system with time sharing. (The university prefers this approach to time sharing because problems then belong to the Academy of Science and not the university).

All of the Akademgorodok is directed by the Presidium of the Siberian Division of the Academy of Sciences of the USSR. However, the overall planning has been difficult because of the different sources of funds to support the different institutes. Novosibirsk University is funded by the Ministry of Higher and Specialized Secondary Education. Other research institutes are supported by the Academy of Sciences.

They are familiar with what's going on in the U.S., but because their computers are not so advanced, they don't expect exotic remote terminal systems soon. They definitely want to go to time sharing displays for teaching basic courses. The planning at the university is based on what equipment the Academy of Sciences Computing Research Center provides. The university collects computing needs from faculty (e.g., business games), determines total need, and based on that need, the university tries to acquire computers to satisfy the need. In the Ministry there is a computer which works out typical proposals and typical projects for use by schools. Some of the packages used here have been developed here, others have been imported and modified.

There is a research sector of Novosibirsk State University. This draws faculty, and some 400 students work as programmers for this sector, working mainly on electronic data processing applications. In regard to the use of computers in instruction, the Rector appeared skeptical that digital computers could adequately simulate chemical reactions. The members of the U.S. delegation talked about business games, PLATO and CONDUIT (project to develop and share computer-based instructional materials). The Rector expressed concern about computer languages, for example, the Physics faculty uses FORTRAN in teaching physics, yet students are taught ALGOL in computer programming classes. He believed there should be more subject oriented languages for small computers.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

The university computer center has 30 employees. There are 15 programmers and 2 administrators. Engineers are trained at the factory.

VISIT TO COMPUTING RESEARCH CENTER OF ACADEMY OF SCIENCES

The meeting was with Professor A. P. Ershov, Corresponding Member of the Academy of Sciences.

The Computing Research Center is a combined research instruction and service center to Akademgorodok. It is one of the research units of the Academy of Sciences. Its work is partially supported by the State and partially by grants from industry. The latter is a natural way to influence industry by providing it with the latest techniques. For example, one of the main activities in compiler writing is for a multi-language processing system for EC-10XX computers. This is a two-year (or more) project under contract to industry.

There are 650 people in the Computing Center; half are in computer services and half constitute the research staff. There are 300 research staff; 120 are Ph.D's and the rest are at the level of candidates. There are 25 doctors of science and 5 are members of the Academy of Sciences. There are 6 departments in the Computing Center: (1) Department of Physics, Atmosphere and Oceans, (2) Department of Mathematical Problems in Geology and Geophysics, (3) Department of Physics and Chemistry, (4) Department of Management Information and Control Systems, (5) Department of Mechanics of Continuous Media, (6) Department of Informatics.

There is a cycle of research over 5-10 years. The source of problems is in the applied sciences and the process takes the following phases: physical problem statement, analysis, mathematical model, computational model, experimental calculation, application package. All software development is under the "application package" area. For example, Dr. Ilyin of the Department of Informatics has developed a package for automated design of high speed electronics devices involving numerical methods in differential parabolic equations.

The individual interest of the Academy members heavily influences the programs undertaken. This is due primarily because these Academy members are directors of institutes, etc. Most such research is State budgeted. Projects in the Computing Center will involve 5-10-20 people. Another example of a coupling of interests of the center and industry was a recently undertaken research program in electronic typesetting.

Professor Ershov described the principal thrusts of the Department of Informatics as:

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

(1) Development of combined projects with industry from the software view which influence other problems.

(2) Converting development software into production software.

(3) Converting experimental and theoretical software into applied software.

Most educational activity conducted by the Academy is conducted by those persons who have teaching positions as secondary jobs. At the 3rd year, students select a narrow specialty. Individual work with students on research projects starts in the 4th year. The 5th year project is called the "diploma thesis" and corresponds to a master's thesis. After the 5th year, students can come to an institute or the university as a junior fellow for 2 years. Next, there are 3 years of continued study as "aspirant" and research on the doctoral research. It is essentially a 5 year doctoral program. About 80% of staff came from Akademgorodok.

The Computing Center organization for service work was also described: There are three BESM-6 computers which offer reliable services, are readily available, and have a good software library. There is one M-200 which is old but has a good programming system. It will be removed this year. In addition, there is one Hewlett-Packard HP-2000F with time-sharing offering BASIC. They expect to have before long an M-4030 (product of Ministry of Automation) and also expect this year the highest model of the ES series (approximately 1.5 million operations per second). There are two operating systems for the BESM-6. The DISPACK operating system is for batch processing. It has very low overhead and is good for production runs. There is a time-sharing operating system with background batch called Operating Systems of Institute of Applied Mathematics (OS-IPM). (Institute of Applied Mathematics in Moscow). The ALPHA language is used which is an extension of ALGOL 60. It produces efficient object time code. They have a high speed BESM ALGOL compiler for short jobs and student programs. About 150-300 large jobs a day are handled from some 30 institutes and 80 organizations. The BESM-6 has 64,000 words of memory. Four parallel jobs can be handled using fixed partitions in memory. Other languages and packages include FORTRAN, a computer graphics package, BASIC for BESM-6, JOSS, and a conversational editor. The HP-2000F is used extensively for high school students locally. There are 24 terminals on the HP-2000F and a similar number on the BESM-6. (They have the usual problem of allocating terminals.) They have a locally developed multi-processor time sharing system, AIST-O which was described at a conference in the U.S. The system has been installed on an M-220 and Minsk-22 plus some special equipment. This system has been moved to a new university at Camerova about 200 miles from Novosibirsk.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

As a service center, the computing research center is "not very fast in throughput." It is not yet fully automated. There is a one-day turn-around with priority override for system programmers. They have an express capability to operate from the card reader without "spooling" which is available in the evening and can give users fast turnaround. It is still an experimental system, however, and not many people can use it. The center is now in the process of "reconstructing" the computing services with a plan to set up a large public room to permit the general user to get fast turnaround on samll jobs. The AIST-0 operating system led the center into operating system research activity. A book is coming out describing AIST-0 with statistics. The measurement and evaluation is being made using hardware monitor. The center has no direct contact with manufacturers.

The center has no regular experience in educational computer use but it is starting experiments on the use of computers in teaching high school students. (It was said to be natural to start students early on computers.) One popular seminar is attended by faculty from secondary schools and institutes who discuss the teaching program for children.

As in the U.S., according to Ershov, the newest computers go into industry where immediate return can be realized. Polytechnical and other institutes have to wait until later when software systems for teaching are available. Furthermore, a new generation of teachers is required to employ appropirately computers in institutes. The best opportunities come to those institutes which focus on a specific industry and can get support from that industry. Minsk was said to be a place where there is a good connection between the polytechnical institutes and industry.

The Informatics Group has three thrusts: (1) schematology, (2) research about programming and (3) parallel programming. There is a project on parallel programming languages which is directed by Dr. Kotov. This work is being moved to a separate laboratory and Dr. Kotov will be its head. (They are not particularly interested in array or pipe-line computers.) Burroughs Corporation was said to be interested in the work of Kotov. Some of the application projects are the following:

1. BETA Project. This project is an experimental compiler writing system based upon unifrom language definition and compiler techniques. There is a search for parametric representation of semantic descriptions of languages. This unification has been developed in a common data bases for techniques. The "incoming language" is translated to an "intermediate language" through the following steps: input string, parsing tree, internal language, optimization, and generation of object code. They have finished the implementation of the trial system. The first language to be implemented in BETA will be PASCAL, followed by PL/I, ALGOL 68,

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

and SIMULA 67. Ershov regards this as a challenging implementation for systems programmers and believes that in 5 years it would be possible to include a compiler to write systems in systems software. He expects to spend about one year on each of the languages and hopes to determine successively appropriate parameters leading to production system. There are about 10 people in the project.

2. The SIGMA Language Project. Dr. Stephanov is working on this project. SIGMA is a kind of parametric language as a combination of some communication data structure. A parametric description of the object computer is provided. For transporatbility of programs from one computer to another it would be necessary only to change parameters. A description is published in the proceedings of an IFIPS working conference. Minicomputers were useful in exploring portability. SIGMA was also described as a high level assembly language with macro definitions, e.g., for ( ):=( ) step ( ) until ( ) do ( ).

3. The SETL Project. This work is carried out in close cooperation with Jack Schwartz of New York University, the inventor of the language. Problem statements can be made in set theory definitions, etc. The project is nearly ready to test. There will be separate but independent implementations.

4. The RITA Project. Ershov hopes to develop universal syntactic and semantic processors with graph theory descriptives of semantics and a tree definition of syntax. There is a thesaurus (or vocabulary) for mapping between syntax and semantic definitions. A test vehicle (called RITA) permits natural language description of geometric pictures. It is expected that a paper will be presented on this topic at the Artificial Intelligence Conference in Tbilisi in September.

VISIT TO INSTITUTE OF AUTOMATION

We met with the Director Designate, Professor Irkovsky; the Scientific Secretary, Professor Sobolov; and two directors of laboratories, Kovalov and Pushnoy. The institute has two principal thrusts:

1. Automation of research based on computers.

2. Coherent, optical devices for measurement of physical processes.

Research is conducted in both physics and biology. In physics, there is work on 1) Research phase transitions of the first order which takes place in electrical explosions of conductors (lasers), e.g., when a heated conductor changes to liquid and then to the gaseous state. It was decided as an attempt to obtain descriptions of systems which have many degrees of

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

freedom and non-linear interactions. 2) Relation of light to matter. They are researching substances to provide optical memories applicalbe to images recorded on very thin films.

In biology there is research on: 1) Use of computation and automation in the research process related to molecular genetics, i.e., bilogical cells, 2) Big neurons. They have built a system of special measurement devices employing lasers and feed data into computer system where mathematical models have been programmed. Using these data they are trying to correct the mathematical models to reflect more accurately reality. They are also trying to understand the concepts on which automation is based.

They have developed a large complex of computers for data collection and control of experiments. Data collection is controlled by a minicomputer making use of an algorithm under which data collection operates. There is a common line which receives outputs from different experiments. Management of inputs is handled by a separate computer. This system will permit computer to computer communication. The main idea is to have a standard setup with a standardized communication link. In addition to the data collection system, there is also a data processing system.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

VISITS IN KIEV

KIEV STATE UNIVERSITY

We met with the following: V.S. Budkin, Vice Rector for Foreign Affairs; Lashkov, Academician, Head, Department of Cybernetics; Streyjak, Head, Department of Physics; Reichkov, Head, Chair of Programming, Department of Cybernetics; Tansura, Manager, Computer Center; Logsiinov, Representative of Ministry of Higher Education; and Melnik, Radio Physics Faculty. Peter Avalioni of the Department of Languages served as escort and interpreter.

Kiev State University was founded in 1834. There are more than 21,000 students and the total staff is 3,500. There are 19 departments or faculties including departments of mathematics, cybernetics, physics, radio-physics, biology, geology, humanities, philosophy, journalism, economics and law. There are also scientific research institutes attached to the university including institutes of humanitarianism, nuclear physics, mathematics, an observatory, etc. There are day, evening, and extension students. Day students number 10,000 and there are 560 post graduates. The post graduates program is 3 years. There are special courses for doctoral candidates. The school is growing rapidly and new buildings are being constructed outside the city. The Computing Center will also be moved out to this complex as present arrangements were described as very unsatisfactory.

Many different departments are trying to get computers. Chemistry and radio-physics already have separate computers (3rd generation). This is encouraged if the machines can be used 100% of the time. Computers are used differently by various departments. Formally, the computing center has responsibility for all the computers, but in practice the departments control the computers in their possession. For students there are laboratories with small computers. There are special courses starting from the first year. Students take an active part in research starting with the 3rd year of studies. The university tries to encourage the use of computers, because in some departments (biology, economics, etc.) they may not realize the value of the computer. The university does not have sufficient computers due to lack of space rather than the lack of computers. (Opportunities to acquire two additional computers had to be declined). The new facilities will help.

The Computing Center has a M-220 and M-222 computer. The physics department has an M-220. And in the students hall there are 4 computers of the MIR I and II types. There are also MIR computers in chemistry. An ES 1030 is coming next year. The MIR computers were designed at the Institute for Cybernetics in Kiev.

There is a close coupling between the Department of Cybernetics at the university and the Institute of Cybernetics of the Academy of Sciences. Academician Glushkov of the Institute of Cybernetics initiated a closed loop system of planning which is being applied to automatic planning for higher education in the country. They are now collecting the data base. On another point

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

regarding the sharing of resources among institutes, ther is an all-union symposium planned for the 4th quarter of 1975 to address such questions.

The delegation also visited the Physics Department located on the new campus. The Head of the department is Professor Streyjak. This department is one of the oldest ones at the university and several other departments were formed from physics including mechanics, mathematics and radio physics. There are 1,000 students in cybernetics and 1,000 more in physics. There are 10 Chairs including theoretical physics, astronomy, optics and spectroscopy, cyrogenics and nuclear physics.

The department started using computers about 15 years ago for calculations in nuclear research. Other Chairs in the department started using the computer later. Students are introduced to the computer the first year. Currently, the department has an ES 1020 and hopes to install a larger machine which will improve both teaching and research. They would like to put certain nuclear experiments on-line and to interface these experiments with a grid network of mini computers. There is about 800 meters between labs and one possibility is to use a laser connection. There was also discussion of a direct link with the Institute of Cybernetics. The ES 1020 configuration in the Physics Department computer center included 4 tapes, 1 printer, 1 card reader, 1 punch and discs.

VISIT TO KIEV POLYTECHNICAL INSTITUTE

We met with V. I. Kostyuk, Director of the Institute and Head of the Department of Cybernetics; Sigorsky, Head, Chair of Theoretical Cybernetics; Trakhementov, Radio Engineering; Slepchenko, Director Computer Center; Petrenko, Communications Electronics.

The Institute was founded in 1898. It now has 12 faculties or departments for day students in radio electronics, radio engineering, electro acoustics, automation and electrical engineering, construction, mechanical engineering, chemistry, physics, heat and power, electro power engineering, mining automation, and electro mechanics. There are evening and correspondence departments also. There are two branches of the Institute, one in Chernikov and one in Gitomir. There is a total of 28,000 students, branches included. Of these half are day students; 450 are post grads. The staff of the Institute number 1,800. The Institute prepares students in 56 professions or specialties. The faculty conducts research as well as teaching. There are more than 2,000 employees in scientific research work. Both students and post graduates are involved in research. Industry supports 10 times as much at the Institute as is supported by the State (Ministry of Higher Education and other organizations). In teaching and in research wide use is made of computers, but computers are used to a lesser extent in management of the Institute. There are also small computers attached to departments or chairs.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

The institute cooperates with many different types of industries, which complicates the problems of concentration on specific areas. Orders are received from industry and interdisciplinary teams are set up to solve problems. The results may be new hardware, new programs, recommendations, papers, etc. Only after receipt, evaluation and acceptance of work does the industry pay the institutes. Students also serve in industries as interns and receive credit for the industrial work.

For instruction, the computer is used to a great extent in automation areas including applied mathematics, control systems, industrial electronics, radio engineering, chemical cybernetics, and cybernetics of electrical networks. Lesser use is made of the computer in telemechanics, electrical engineering, power engineering, semiconductors, etc. In other areas computers are used solely as problem solving devices.

Slepchenkov, Director of Computer Center, described the functions and facilities. Together with small digital computers, there are a total of 70 computers. There is a special department in the Computing Center which has the most powerful system at the Institute; other computers are located in faculty laboratories which are accountable to the Computing Center and whose functions are to support laboratory research and student use. The Computing Center provides for preparation of a student in five courses which are obligatory for all students: fundamentals of electronics, algorithmic languages, fundamenthals of programming, practical work at the Computer Center, and computers in engineering and economic design. General teaching of computer science is carried out by various chairs and a deeper specialization is possible in special laboratories attached to these chairs.

All students have access to computers. The first year they use small computers which they learn to operate themselves. The second year students use devices for data preparation and hand in problems at the Computer Center. The turnaround is 24 hours. Five computers are available for student use. One medium size computer usally supports about 300 student problems per day or about 40,000 per quarter or semester. Each student problem is run three times which permits changes in parameters. Students are also using the computer for computer-aided design and control problems. The center has additional courses on special languages. There is also a "student design bureau" attached to the dean's office.

The Institute has several third generation computers including a RIAD ES 4030 (between an ES 1030 and an ES 1040), ES 1020 (or possibly an ES 1030), and M-6000's in laboratories. The loading of these computers is planned. All chairs submit orders for computer service before the year begins. Computer time is allocated from 8:00 a.m. to 10:00 p.m. The medium size computers are operated 24 hours a day; the smaller computers only 2 shifts. Classes using card punches and tape punches submit programs for 24 hour turnaround. Their plan, is to purchase 2 computers of the ES 1040 or ES 1050 class during the next two years.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

The Computer Center employs 200 persons including 60 programmers (also work in field of improving education program). Each chair has 10-15 programmers and are given computer time. Such a small staff is not sufficient and the Computer Center is expanding. It is the belief that every engineer should be able to solve problems on the computer independently. There are also specialized consulting groups for various chairs. There is extensive use of both the MIR I and MIR II computers for instruction and they have a large library of application programs. The MIR computers which were developed at the Institute of Cybernetics have a variable word length (up to a thousand symbols). When the additional ES computers arrive, it is planned to located terminals at individual chairs of the Institute. The Institute is also working at creating an integrated system of management linking all computers. They plan to develop their own operating system through the Chair of Applied Mathematics. There is also an 8-teletype time-sharing system in a class for students who use ALGOL and a graphics terminal on a 4030 computer that is used for debugging programs. The M-6000 computer is used as a pre-processor (mini computer) or communication controller. There was also much discussion of the amount of computer time available to students, the cost of computer centers, cost of tuition, etc.

In a tour of facilities, the delegation visited many laboratories. The BESM 4M is on a 3-shift basis for students with both FORTRAN and ALGOL. The load is about 1000 problems a day. The machine has 32,000 words of core (45 bits plus 3 control bits) and operates at 25,000 operations per second. A MIR II and a PDP 8 are linked to the BESM 4. The 3rd, 4th and 5th year students use application programming packages. Of the 70 computers at the Institute, most are MIR computers. For example, in two laboratories for student use, there were two MIR I in each. One student lab with 10 students had 4 MIR I's available. We visited tape processing rooms for both the BESM 4 and MIR computers. A Hewlett-Packard 2116 was used as a "front end" on the 4030 to support terminals.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5

APPENDIX

Included in this appendix are copies of the title pages of books, monographs and other materials received by the delegation. These materials are available for use by interested parties. Please contact D. D. Aufenkamp, National Science Foundation, Division of Computer Research, (202) 632-5743.

Approved For Release 2001/11/19 : CIA-RDP79-00798A000200020018-5